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Warnings and Precautions

The following symbols indicate important safety warnings and precautions throughout this manual.

They are defined as follows:

	WARNING indicates that serious bodily harm or death may result from failure to adhere to the precautions.

	CAUTION indicates that damage to equipment may result if the instructions are not followed.

	NOTE suggests optimal conditions under which the equipment will operate effectively and safely.

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Introduction

Overview

This manual is a guide and reference for programming COMMPAK I/O8 radios using ENCOM's ControlPAK™ programming and diagnostics software.

This manual contains instructions, suggestions, and information which will guide you to set up and achieve optimal performance from your equipment.

Description of the I/O8

The COMMPAK I/O8 has been designed specifically for remote ON/OFF control and Status/Alarm monitoring applications. The radios feature two way communication, the ability to confirm status at a Remote site and timer outputs that can be pre-programmed for up to two hours eliminating the need for timer relays.

All typical system designs are supported including:

- Point to Point
- Point to Multipoint
- Multipoint to Point
- Multipoint to Multipoint

The radio employs ENCOM's License-Free Frequency Hopping Spread Spectrum Technology. This technology has been designed to provide reliable, long-range, wireless communications (up to 20 miles with L.O.S.).

The COMMPAK I/O8 accepts up to 8 Inputs and is configured with 8 Outputs. The I/O mapping within a system is configured using the ControlPAK™ software.

Antennas with I/O8 Units

The COMMPAK I/O8 is designed with a Reverse Polarity TNC Female antenna connector. An antenna is not supplied with the I/O8 unit; please contact your local ENCOM Wireless dealer for ordering.

Acceptable Antennas for use with I/O8 Units

There are 2 types of antennas typically used for COMMPAK I/O8 systems:

- Yagi antenna
- Omni antenna

Other types of antennas can be used if your system has special requirements.

Additional information for these antennas is located in **Appendix A**.

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This section describes the primary features of the ControlPAK *Main Configur*ation screen.

Radios That Work With ControlPAK

The ControlPAK software works with the following radios:

Radio	Name
5.8 GHz Radio	CommpakBB58 CommpakBB58/58 CommpakBB58/49 CommpakBB58/24
4.9 GHz Radios	CommpakBB49 CommpakBB49/24
2.4 GHz Radios	CommpakBB24

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Connecting a Radio to a Computer

Before you can begin to use the ControlPAK software, you must have a radio connected to your computer.

LED Indicators

There are four LED indicators on your Commpak I/O8 radio as follows:

- **PWR LED:** Indicates the radio is powered ON.
- **INPUT LEDs':** Indicate the status of each of the 8 inputs. The LED for an activated input will be ON.
- **OUTPUT LEDs':** Indicate the status of each of the 8 Outputs. The LED for an activated Output will be ON.
- **LINK LED:** Indicates the radio is linked and communicating.

Data Connection

You must connect your COMMPAK I/O8 radio directly to your computer for the initial programming and set up.

Your COMMPAK I/O8 radio comes supplied with a programming cable (CB-109) and a wall cube power supply (BH-36A).

1. Plug in the female end of wall cube power supply to the COMMPAK I/O8 radio and the other end into a 240V wall outlet.

2. Plug the telephone jack (RJ-45) end of the programming cable into the Commpak I/O8 unit. The serial end of the unit is to be plugged into the serial port of the computer.

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Installing ControlPAK

Before you can perform a configuration, you must have the radio connected (refer to the previous chapter), and you must install the ControlPAK software.

The disc located in the back pocket of the Installation Guide contains the ControlPAK software. Alternatively, you can download the most recent version from our website at www.encomwireless.com. Ensure you are using ControlPAK version 4.3.8 or higher.

Technical Specifications for Installing ControlPAK

To run ControlPAK on your PC, you require the following hardware and software:

- Windows XP or Windows Vista
- 1GB RAM
- 100 MB free hard drive space
- Microsoft .NET framework 2.0

After downloading the latest version of the ControlPAK software from www.encomwireless.com:

1. Click **Setup**
   The *ControlPAK Install* screen appears.
2. Click **Next**.
   The *ControlPAK Software License Agreement* screen appears.
3. Click **I agree**, and then click **Next**.
   The *Upgrade/Uninstall* screen appears.
4. Click **Next**.
   The *Select Directory* screen appears.
5. Enter the directory in which you would like the ControlPAK software install, or click **Next** to accept the default directory.
   The *Start Copying Files* screen appears.
6. Click **Next**.
   The Setup file copies the appropriate files to your computer, and then registers the software.
7. At this point, if you are running Windows Vista, you must turn off your Use Account Control. Instructions to do this are located at http://windowshelp.microsoft.com/Windows/en-US/help.
8. Click **Next**, then click **Finish**.
   The ControlPAK icon appears on your desktop.
   Note: If you haven't yet turned off your User Account Controls, you must do so now for the ControlPAK software to work.

Congratulations, you have successfully installed ControlPAK.

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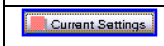
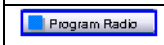
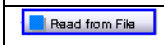
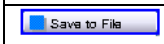
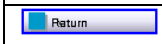
ControlPAK Navigation Buttons

The left of the *Main Configuration* screen contains a series of function buttons. They are described in the following table.

Button	Description
	**Current Settings** uploads a radio's current configuration data into ControlPAK. If you create a custom configuration and make an error, click **Current Settings** to replace the parameters that are currently displaying on-screen to the settings currently on the radio.
	**Program Unit** downloads your current on-screen configuration to a radio.
	**Read From File** uploads radio configuration data from a file into ControlPAK. This allows you to copy a configuration to another radio. **NOTE:** The radio is not programmed until you click **Program Radio**.
	**Save to File** saves the configuration settings to a file for use later on. You must click **Program Unit** each time you want to download a configuration to a radio; **Save To File** only saves a file to a folder.

	Quality of Service Tool of the VSWR test can be found from the Tools Button
	Quality of Service Tool that allows to see the noise level in the area against the hopping pattern that is used
	Provides you with information about your radio, and also allows you to upgrade the radio's firmware
	**Return** to the *ControlPAK Login* screen

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Configuring Your I/O8 Radio

The first step in using ControlPAK to configure your radio is to enter the correct configuration mode. There are three options available from the main screen: **ETHERNET**, **SERIAL**, and **CONTACT CLOSURE**.

Entering Configuration Mode

To enter Configuration Mode:

1. From your desktop, double-click the **ControlPAK** icon.
   The *ControlPAK main* screen appears.

2. Click **CONTACT CLOSURE**.

3. Click **COMMPAK I/O8**.

The ControlPAK software loads, and then the *ControlPAK.NET Home* screen appears.

4. Make sure the Communications Port and Baud Rate are correct. In addition the Data/Parity/Stop Bits need to be correct. These settings can be left as default unless you are using a different communications port.

   Click the Connect button to log into the I/O8 radio. The **Login** dialog appears with a status bar indicating logging is occurring:

   Once the logging into the unit has completed, you will be at the General Setup screen.

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Configuring General Setup

The *General Setup* page allows you to configure your radio's Unit Address, Primary Hop, Output Power, Network Address and Noise Filter settings.

1. After you reach the *General Setup* screen, you can start to configure your radio's settings.
2. Complete the following fields on the *Basic Settings* page (refer to the table on the following page):

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Section	Field Name	Description
General Setup	Unit Address	➢ The **Master radio Unit Address** is set to 0 by ControlPAK.NET™ and is not User configurable. ➢ The Unit Address is used for **Remote Configuration** and Remote Diagnostics functions. ➢ The Unit Address must be unique for each Remote and Repeater radio in a system.
	Network Address	➢ The Network Address defines a specific system to which individual radios can be assigned. ➢ By establishing a system under a common Network Address, the network can be isolated from another network to reduce interference. ➢ Only the radios that have the same network address can communicate to each other. ➢ Valid values for the Network Address range from 0 to 255, inclusive.
	Output Power	➢ The **default power level** for the COMMPAK I/O 8 is 1 Watt. ➢ The radio transmit power level may be changed to meet your system requirements.
	Primary Hop Pattern	➢ The Primary Hopping Pattern is used by the **Master** radio to communicate with: 1. Remote radios that communicate directly to the Master radio. 2. Repeater radios that communicate directly to the Master radio. ➢ The Primary Hopping Pattern is used by **Remote** radios to communicate: 1. Directly to the Master radio. 2. To a Repeater Radio. ➢ The Primary Hopping Pattern is used by a **Repeater** radio to communicate: 1. Directly to the Master radio. 2. With an upstream Repeater radio.
	RF Noise Filter	The RF Noise Filter optimizes the selectivity of the COMMPAK I/O8 receiver. When it is enabled the filter will improve the rejection of interfering signals but the radio sensitivity typically decreases by 6 dBm.

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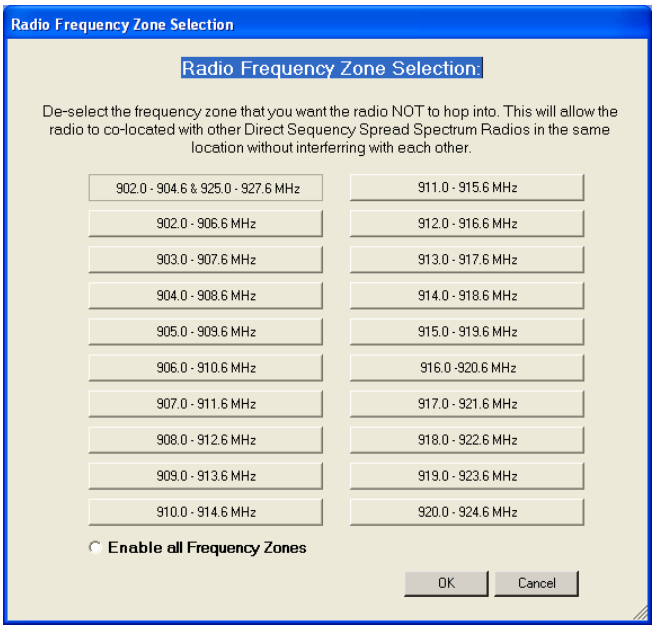
General Setup	Frequency Zone	Allows you to select a Frequency Zone that you DO NOT want the radio to use in its Hop Pattern. Select **Enable all Frequency Zones** if you want the radio to use the entire band: 

Radio Frequency Zone Selection
Radio Frequency Zone Selection:
De-select the frequency zone that you want the radio NOT to hop into. This will allow the radio to co-located with other Direct Sequency Spread Spectrum Radios in the same location without interferring with each other.
902.0 - 904.6 & 925.0 - 927.6 MHz
911.0 - 915.6 MHz
902.0 - 906.6 MHz
912.0 - 916.6 MHz
903.0 - 907.6 MHz
913.0 - 917.6 MHz
904.0 - 908.6 MHz
914.0 - 918.6 MHz
905.0 - 909.6 MHz
915.0 - 919.6 MHz
906.0 - 910.6 MHz
916.0 -920.6 MHz
907.0 - 911.6 MHz
917.0 - 921.6 MHz
908.0 - 912.6 MHz
918.0 - 922.6 MHz
909.0 - 913.6 MHz
919.0 - 923.6 MHz
910.0 - 914.6 MHz
920.0 - 924.6 MHz
Enable all Frequency Zones
OK
Cancel

3. After you finish configuring the radio's General Setup, you have several options.
   - If you are configuring a new radio, then continue to the **Wizard Setup** tab.
   - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to upload the new configuration to the radio.
   - If you would like to program your new configuration to the radio, click **Program Radio**. Note that this will not save the new configuration to a file; to do that you must first click **Save to File**.
   - If you need to update your input and output configuration, click the **I/O Configuration** button.

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Configuring Wireless Settings

The Wireless Settings are set by going through the **Wizard Setup** from the **General Setup** page.

From the **Wizard Setup** page you can also set your radio to be a Master, Repeater, or Remote.

After you have set the radio's **General Setup**, you can configure the radio's **Wizard Setup**.

1. From the *General Setup* page, click the **Wizard Setup** button.
   The *Wizard Setup* page displays.
2. Complete the following fields:

Section	Field Name	Description
Setup Wizard	**Step 1:** Select Hardware Type	➢ This field will be greyed out as it is only used for reference to show which Commpak I/O8 hardware you are configuring.
	Step 2: Select I/O Topology	➢ **Point to Multi-point** offers the ability to have one Commpak I/O8 radio communicate to many Commpak I/O8 remote radios. ➢ **Multi-point to Multi-point** offers the ability to have each Commpak I/O8 radio talking to everyone else in the radio network. This will add an overhead of latency to the network with this setting due to the additional communicative abilities. ➢ Select either option for your radio network.
	Step 3: Select Radio Configuration	➢ Select the number of Repeater Levels. ➢ The selections will appear in the drop down menu accordingly.
	Step 4: Edit I/O Mapping	➢ I/O Mapping is used to configure the physical input and outputs for the COMMPAK I/O8 radio.

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3. After you finish configuring the radio's Wireless Settings you have a few options available to you:
    - If you are configuring a new radio, then click on the **I/O configuration** button.
    - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to upload the new configuration to the radio.
    - If you would like to send your new configuration to the radio, click **Program Radio**. **NOTE**: This does not save the new configuration to a file; to do that you must first click **Save to File**.

Configuring the I/O Mapping Setup

The I/O Mapping Setup can be access by either going though the Wizard Setup or directly by accessing it through the General Setup.

I/O Setup Tabs

The three I/O Setup tabs are used in conjunction with either an ENCOM WEB I/O radio or another COMMPAK I/O8 radio. The tabs are as follows:

- I/O Mapping
- Scheduler
- Encom Protocol

Configuring the I/O for WEB I/O Use

For more information on the ENCOM WEB I/O radios go to:

www.encomwireless.com

To configure the COMMPAK I/O8 with WEB I/O use:

1. From the *I/O Setup* page, click the **I/O Mapping** Tab. The Enable I/O Mapping is to remain unchecked.
2. From the Scheduler Tab go through the following steps below:

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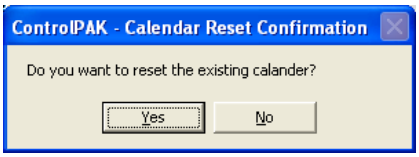
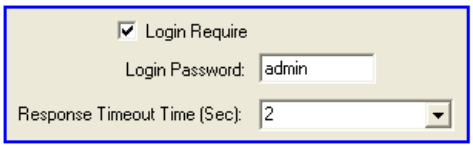
Section	Field Name	Description
Real Time Clock Setup	Use Computer Time to Update RTC	➢ **Enable** by placing a **check mark** in the box next to the **Use Computer Time to Update RTC** box. ➢ Press the **Update Now** to set the correct Time Zone, Date, Time, and Daylight Savings schedule. ➢ **Disable** by leaving the box next to the **Use Computer Time to Update RTC box** blank. This will require manual entry of the correct Time Zone, Date, Time, and Daylight Savings schedule.
	Enable Scheduler	**Enable** by placing a **check mark** in the box next to the **Enable Scheduler** field. Enabling this field will prompt you to reset the calendar; select Yes.  Enable the COMMPAK I/O8 radio to link schedules with the WEB I/O radio by placing a check mark in the Follow Master box. The schedule will remain blank until synchronization with the WEB I/O master unit takes place. A stand alone schedule can be programmed to the COMMPAK I/O8 radio as well. Please see **Appendix B** for setting up the schedule.
Network Filter Setup	ENCOM Protocol	Leave as default as shown below: 

3. After you finish configuring the radio for WEB I/O use, you have several options:
   - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to

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upload the new configuration to the radio.

- If you would like to program your new configuration to the radio, click **Program Radio**. **NOTE:** This does not save the new configuration to a file; to do that you must first click **Save to File**.

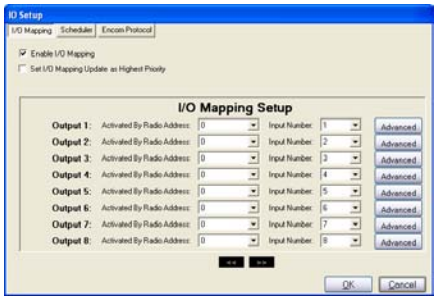
Configuring the I/O for I/O8 Use

From the I/O Mapping Tab enable the I/O Mapping by placing a check mark in the Enable I/O Mapping box:

1. Enable the Set I/O Mapping Update as Highest Priority if the inputs and output status is more important than the scheduler operation (only for use with a WEB I/O).

2. Select the Output you want activated on this radio you are connected to and select the radio number and the input number that is activating the output of this radio.

   For example, by default Output 1 is going to be activated by Radio Address 0 (this being the Master radio as it is always set as 0) and input number 1 from the Master radio.



NOTE: For Advanced Setup refer to Appendix C

3. After you finish configuring the radio for I/O8 use, you have several options:

   - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to upload the new configuration to the radio.

   - If you would like to program your new configuration to the radio, click **Program Radio**. **NOTE:** This does not save the new configuration to a file; to do that you must first click **Save to File**.

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Setting a Master Radio

Each network must have one radio configured as the Master radio. The Master radio is always the radio that is physically closest to the network operations end of the network.

To set a radio as the Master:

1. Open **ControlPAK** and select **CONTACT CLOSURE**, then **COMMPAK I/O8** and **Connect** to log into the connected radio.
   The *General Setup* screen appears.
2. Select the Wizard Setup and proceed through the steps (Refer to the section *Configuring the Wireless Setup*).
3. Configure the I/O8 radio for either operation with a WEB I/O or with an I/O8 system (Refer to the section *Configuring the I/O Mapping Setup*). After you set a radio to be the Master radio, you have several options:
   - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to upload the new configuration to the radio.
   - If you would like to set your new configuration to the radio, click **Program Radio**. Note that this does not save the new configuration to a file; to do that you must first click **Save to File**.

Setting a Remote Radio

A network must have one radio configured as the Master. The number of remotes that are allowed in a network can be up to 255 remotes.

To set a radio as the Remote:

1. Open **CONTROLPAK** and select **CONTACT CLOSURE**, then **COMMPAK I/O8** and **Connect** to log into the connected radio.
   The General Setup screen appears.
2. Select the Wizard Setup and proceed through the steps. During the Wizard Setup at Step 3, select the option for the Remote (Refer to the section *Configuring the I/O Mapping Setup*). Always have a unique Radio Address for each Remote in your system. After you set a radio to be the Remote radio, you have several options:
   - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to upload the new configuration to the radio.
   - If you would like to set your new configuration to the radio, click **Program Radio**. Note that this does not save the new configuration to a file; to do that you must first click **Save to File**.

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Setting a Repeater Radio

A network must have one radio configured as the Master. The number of repeater radios in a system can be 254.

To set a radio as the Repeater:

1. Open **CONTROLPAK** and select **CONTACT CLOSURE**, then **COMMPAK I/O8** and **Connect** to log into the connected radio.
   The General Setup screen appears.
2. Select the Wizard Setup and proceed through the steps. During the Wizard Setup at Step 3, select the option for the Remote (Refer to the section *Configuring the I/O Mapping Setup*). Always have a unique Radio Address for each Remote in your system.
3. Select the Primary Hop pattern to match the upstream radio it is communicating to and select the Secondary Hop pattern to match the downstream radio you are communicating to. After you set a radio to be the Remote radio, you have several options:
   - If you are editing an existing radio configuration and would like to save your new configuration to a file (to share with other radios on your network), click **Save to File**, then click **Program Radio** to upload the new configuration to the radio.
   - If you would like to set your new configuration to the radio, click **Program Radio**. Note that this does not save the new configuration to a file; to do that you must first click **Save to File**.

Saving a Configuration

After you edit an existing radio configuration or create a new radio configuration, the ControlPAK software allows you to save the new configuration to a file. This allows you to copy the radio configuration over to several other radios.

To save a configuration:

1. Configure your radio to your specifications.
   Refer to the previous sections of this manual to configure your radio.
2. After you complete your configuration, click **Save to File** at the bottom of the *Main Configuration* screen.
   The *Save As* screen appears.
3. Enter an appropriate **File Name** in the *File name* field.
4. Click **Browse Folders** and select the appropriate folder in which to store the new configuration.
5. Click **Save**.
   The *LANPak* window appears, asking you to add a description of the file.
6. Enter a file description and click **OK**.
   The file is now saved under the new filename and in the folder you specified.

NOTE	Saving a configuration does not program the radio. To send a configuration to the radio, you must click **Program Radio**.

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Setting a Configuration

After you edit or create a new configuration, you must send the new configuration to the radio. It does not happen automatically.

To set a configuration:

1. Configure your radio to your specifications.
   Refer to the previous sections of this manual to configure your radio.
2. After you complete your configuration, click **Program Radio** at the left in the *General Setup* screen.
   After the configuration downloads, you can disconnect the radio and either program a new radio or exit the software. return to the *Real Time Network Scan list* screen.

Sharing a Configuration over Several Radios

After you save a configuration as a file, you can download that configuration to other radios.

To share a configuration file:

1. Connect the radio that you want to configure to the computer that is running the ControlPAK software.
2. Open **ControlPAK** and select **CONTACT CLOSURE**, then **COMMPAK I/O8** Connect.
   The *General Setup* screen appears.
3. From the *General Setup* screen, click **Read from File**.
   The **Open** screen appears.
4. Navigate to the file you want to share, and click **Open**.
   The *Radio Configuration File Read Selection* window appears, listing all the configurations that are available in that folder.
5. Select the appropriate file and click **OK**.
   The configuration from the file replaces the radio's existing information.
6. Click **Program Radio** to save this information to the new radio.
   Note that you will have to make some changes to the configuration, for example only one radio can be the Master radio, and each radio requires a distinct unit address.

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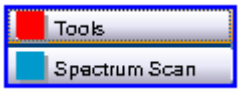
Using the Diagnostic Tools

This section describes ControlPAK's Diagnostic Tools that you can use with your broadband radios. There are three Diagnostic Tools:

1. VSWR Antenna Test

2. Spectrum Scan Test



VSWR Antenna Test

The Voltage Standing Wave Ratio (VSWR) test measures the amount of reflected power that is traveling back into the radio from the cable length and antenna.

The reflected power should be less than 10% of the Forward Power; this is approximately a VSWR ratio of 2:1.

A higher reading is usually the result of incorrectly installed connectors and/or moisture inside the connectors and/or the antenna or feedline.

It is recommended to use a Wattmeter for a in depth and accurate measurement.

To run the VSWR Antenna Test:

1. Select Tools and select the frequency channel you would like to test for reflection. By default it is set at 915 MHz.

2. Select the Key Up Time. By default it is set to 10 seconds.

3. Press **Key The Radio** button to start the test.

Spectrum Scan Test

The Spectrum Scan acts as a spectrum analyzer running a frequency scan across the 900MHz frequency range to analyze for noise.

A yellow line or spiked line will appear indicating the strength of the noise in a particular frequency range.

The red bars overlapping the yellow noise line indicate the current hopping pattern that is in use. In order to minimize the noise interference a different hopping pattern can be selected and overlay on the noise pattern.

To run the Spectrum Scan Test:

1. Select the red bar graph button to overlay your hop pattern on the spectrum scan.

2. Select the hopping pattern number you are using or would like to analyze from Group A or B.

3. Press the green start button to run the spectrum analysis test. The yellow line will indicate the noise in the environment. The red button will stop the test.

Save the Spectrum Scans for later use for technical support assistance from Encom Wireless.

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Applications

COMMPAK I/O8 Inputs

The COMMPAK I/O8 is configured with a 9 position quick connect barrier block for connection of up to 8 Inputs.

An Input is activated when it is connected to DC ground using a switch or relay contacts.

An Input can also be activated when pulled low by an Open Collector output.

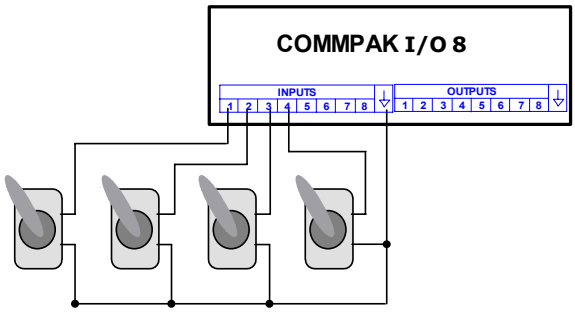
Inputs applied to the COMMPAK I/O8 can be:

- Dry Contacts (no voltage applied). For example, a switch or relay.
- Open Collector, with a voltage range of: 0 to +40 VDC. For example, a Traffic Controller output.

Using Input Switches with your I/O8 Radio

The following application outlines the connection of 4 switches to the COMMPAK I/O8 Inputs. Turning on a switch closes the contacts which connects the Input to ground.

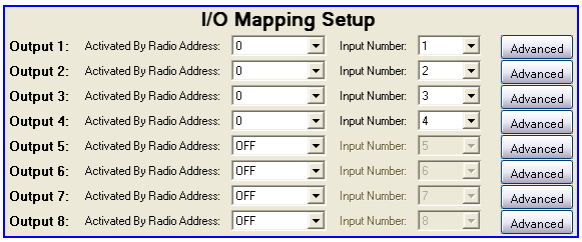
For example, when the switch that is connected to Input 1 it physically turned ON, Input 1 of the COMMPAK I/O8 is tied to ground and activated.



You do not have to "program" the Inputs in the ControlPAK software. The programming is only on the Outputs of the either this radio or another radio.

The Outputs are programmed so that the installed inputs are used as the activation switches for your system.

For example, if we are programming the outputs of another COMMPAK I/O8 the programming for the I/O configuration would be shown below:


I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: 0 Input Number: 2 Advanced
Output 3: Activated By Radio Address: 0 Input Number: 3 Advanced
Output 4: Activated By Radio Address: 0 Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

The Outputs 1 to 4 of our Remote Radio are going to be activated by Radio address 0 (this being our Master radio with the 4 input switches) and the corresponding Input number.

Any Input can activate any Output.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

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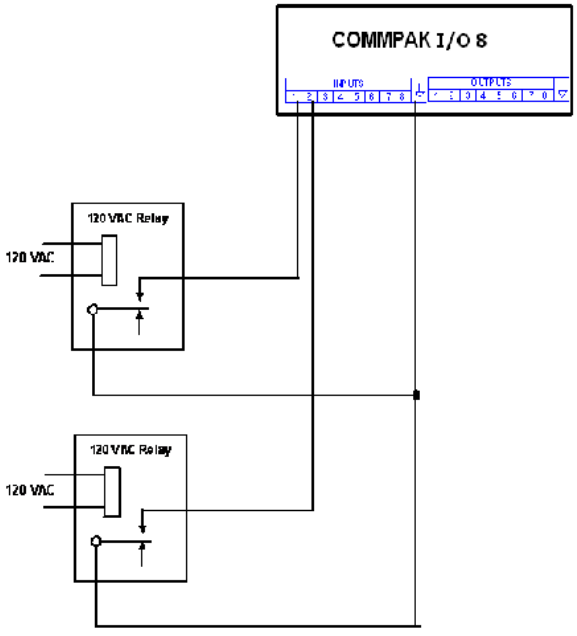
Using Relays as Input Connections with the I/O8 Radio

The following application outlines the connection of 2 relays to the COMMPAK I/O8 Inputs.

When a relay is activated, the Open contacts of the relay close which connects the COMMPAK I/O8 Input to ground. This will activate the corresponding I/O8 input.

The following diagram shows 120 VAC relays but any type of relay with dry contacts (no voltage applied to the contacts) may be used.

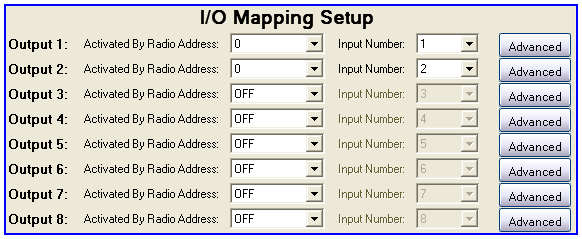
ONLY the relay dry contacts are connected to the COMMPAK I/O8 inputs. The relay operating voltage is not a concern.



You do not have to "program" the Inputs in the ControlPAK software. The programming is only on the Outputs of the either this radio or another radio.

The Outputs are programmed so that the installed input relays are used as the activation switches for your system.

For example, if we are programming the outputs of another COMMPAK I/O8 the programming for the I/O configuration would be shown below:


I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: 0 Input Number: 2 Advanced
Output 3: Activated By Radio Address: OFF Input Number: 3 Advanced
Output 4: Activated By Radio Address: OFF Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

The Outputs 1 and 2 of our Remote Radio are going to be activated by Radio address 0 (this being our Master radio with the 2 input relays) and the corresponding Input number.

Any Input can activate any Output.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

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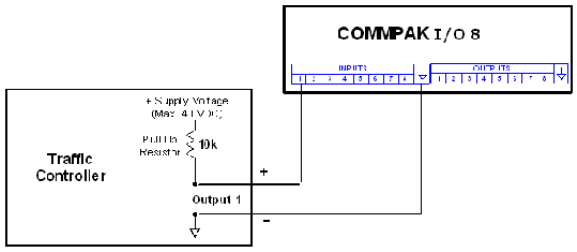
Using Traffic Controller Outputs as Input Connections with the I/O8 Radio

The following application shows you how to connect a Traffic Controller to the Input Connection of an I/O8 Radio.

A Traffic Controller is an example of a device with Open Collector Outputs. Refer to the User Manual of your Traffic Controller or other equipment to determine if it is configured with Open Collector Outputs.

The Controller Equipment open collector outputs are to have a Pull Up Resistor (10K ohm) installed. The Controller Equipment signal ground must be connected to the COMMPAK I/O8 ground.

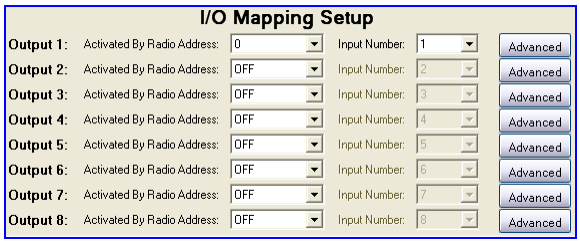
Connect each Controller Equipment open collector output to the COMMPAK I/O8 Inputs as shown below:



You do not have to “program” the Inputs in the ControlPAK software. The programming is only on the Outputs of the either this radio or another radio.

The Outputs are programmed so that the installed Open Collector Input is used as the activation switch for your system.

For example, if we are programming the outputs of another COMMPAK I/O8 the programming for the I/O configuration would be shown below:


I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: OFF Input Number: 2 Advanced
Output 3: Activated By Radio Address: OFF Input Number: 3 Advanced
Output 4: Activated By Radio Address: OFF Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

The Output 1 of our Remote Radio is going to be activated by Radio address 0 (this being our Master radio with the Open Collector input relay) and the corresponding Input number.

Any Input can activate any Output.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

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COMMPAK I/O8 Outputs

The COMMPAK I/O8 is configured with a 9 position quick connect barrier block for connection of 8 outputs.

The COMMPAK I/O8 Outputs are Open Collector Outputs with the following specifications:

- Maximum voltage: 30 VDC
- Maximum sink current per output: 250 mA

The COMMPAK I/O8 Open Collector Outputs are pulled low ("switched" to ground) when activated.

You must connect your equipment signal ground to the COMMPAK I/O8 ground in order to ensure there is a common ground point and at the same level. The outputs can be configured to "open" when activated; for example, switch from logic low to Open.

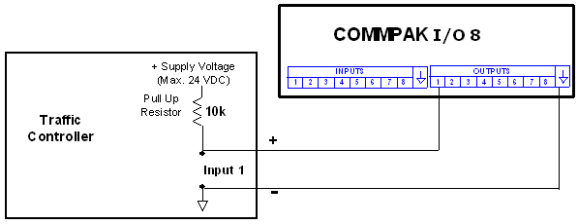
The COMMPAK I/O8 Outputs do not provide a power source for your equipment.

Using a Traffic Controller for an Output Connection with the I/O8 Radio

The following application shows you how to connect a Traffic Controller to the output of the COMMPAK I/O8 radio.

A Traffic Controller may require a Voltage Level Change on its inputs in order for activation to occur. A pull up resistor is required on the input(s) of the equipment that require a Voltage Level Change on its Inputs.

If your equipment is not configured with internal pull up resistors on its inputs they must be installed as shown below:



In the above diagram, when the COMMPAK I/O8 Output is not activated, the Controller Input is pulled up to its supply voltage through the pull up resistor. The Controller Input is at a high level.

When the COMMPAK I/O8 Output is activated, it is pulled to ground and the Controller Input is also pulled to ground. The Controller Input is at a low level.

Refer to the User Manual for your Traffic Controller or other equipment to determine if it requires a Voltage Level Change and if it is configured with a pull up resistor.

You do not have to "program" the Inputs in the ControlPAK software. The programming is only

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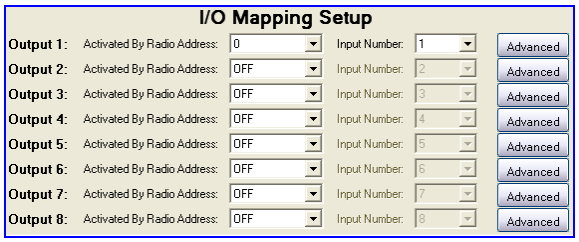
on the Outputs of the either this radio or another radio.

The Outputs are programmed so that the installed Open Collector Output is used as the activation switch for your system.

For example, if we are programming the outputs of another COMMPAK I/O8 the programming for the I/O configuration would be shown below:


I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: OFF Input Number: 2 Advanced
Output 3: Activated By Radio Address: OFF Input Number: 3 Advanced
Output 4: Activated By Radio Address: OFF Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

The Output 1 of our Remote Radio is going to be activated by Radio address 0 (this being our Master radio with the Open Collector input relay) and the corresponding Input number.

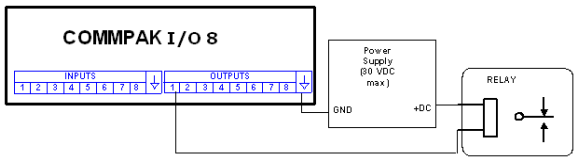
Any Output can activate any Input.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

Using a Relay as an Output Connection with I/O8 Radios

The following application shows how to connect a relay to your COMMPAK I/O8 radio Output.

In order to drive a relay or contactor load, connect the COMMPAK I/O8 radio to the relay as shown below:

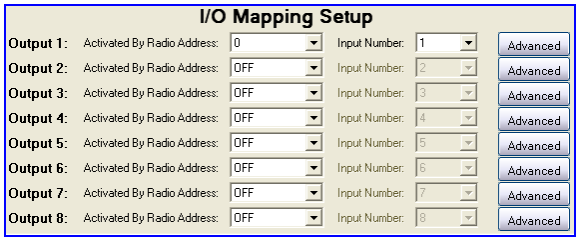


Damage to the COMMPAK I/O8 outputs may occur if the COMMPAK I/O8 maximum output ratings (current and voltage) are exceeded.

You do not have to “program” the Inputs in the ControlPAK software. The programming is only on the Outputs of the either this radio or another radio.

The Outputs are programmed so that the installed Open Collector Output is used as the activation switch for your system.

For example, if we are programming the outputs of another COMMPAK I/O8 the programming for the I/O configuration would be shown below:


I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: OFF Input Number: 2 Advanced
Output 3: Activated By Radio Address: OFF Input Number: 3 Advanced
Output 4: Activated By Radio Address: OFF Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

The Output 1 of our Remote Radio is going to be activated by Radio address 0 (this being our

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Master radio with the Open Collector input relay) and the corresponding Input number.

Any Output can activate any Input.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

Loop Back Status Confirmation

For applications requiring confirmation of data reception or confirmation of end device status, a COMMPAK I/O 8 installation can be configured with a "Loop Back" or "External" Status confirmation:

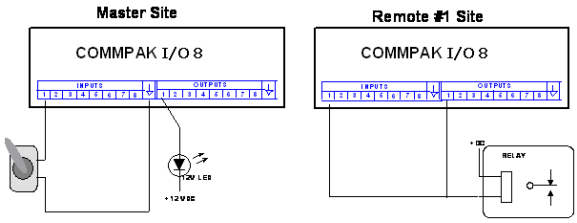
1. Loop Back Status confirmation requires the connection of the COMMPAK I/O 8 Output to the end device as well as one of the COMMPAK I/O 8 Inputs. The Output is looped back to an Input. This setup confirms the COMMPAK I/O 8 has received the Contact Closure status change only - it does not indicate the status of the end device.

2. External confirmation requires the User to connect a Status signal from the equipment into one of the COMMPAK I/O 8 Inputs. This setup confirms the Contact Closure status change was received by the COMMPAK I/O 8 and it provides an indication of the status of the end device.

Using a Loop Back Status Confirmation

The following application shows how to setup a system configured with a Loop Back Confirmation Status.

The diagram is as follows:



The system would operate in the following manor:

- The switch at the Master Radio location is turned ON.
- This status change is transmitted to the Remote Radio.
- Output 1 of the Remote Radio is activated.
- The relay is activated by Output 1 (which is to connect to an end device).
- Input 1 of the Remote Radio is pulled low by Output 1 and is activated. This status change is transmitted to the Master.
- Output 1 of the Master is activated, which turns the corresponding LED ON.
- This setup confirms the Remote Radio received the status change but it does not indicate the status of the device connected to the Remote Radio.

You do not have to "program" the Inputs in the ControlPAK software. The programming is only on the Outputs of the Remote Radio.

For example, if we are programming the outputs of the Remote COMMPAK I/O8 the programming for the I/O configuration would be shown below:

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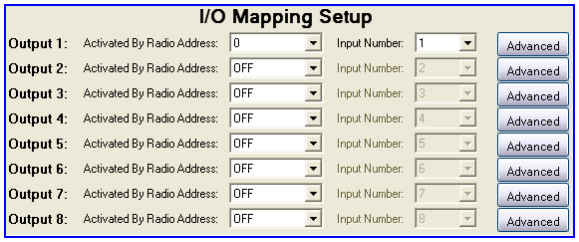
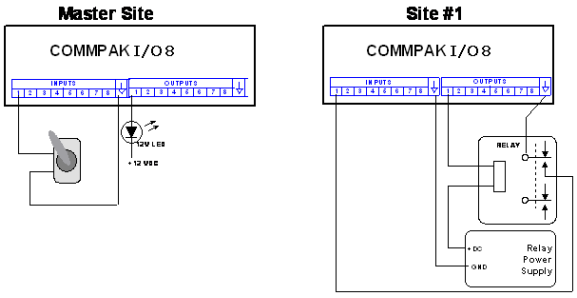

I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: OFF Input Number: 2 Advanced
Output 3: Activated By Radio Address: OFF Input Number: 3 Advanced
Output 4: Activated By Radio Address: OFF Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

Any Output can activate any Input.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

Setting Up an External Status Confirmation with I/O8 Radios

The following application is an example of using a COMMPAK I/O8 Radio system configured for External Confirmation. The diagram below shows the layout:



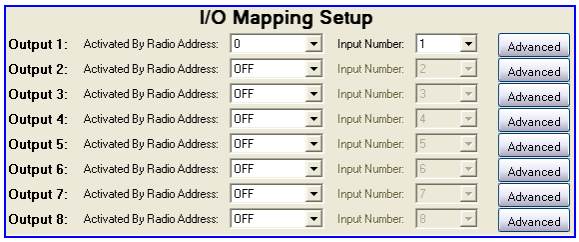
This system operates in the following manor:

- The switch at the Master is switched ON (closed).
- Input 1 of the Master is now connected to ground through the switch and is activated. This status change is transmitted to Remote Radio.
- Output 1 of Remote Radio is activated.
- The relay is activated; both sets of its contacts switch. The set of contacts with no connections shown would be connected to the end device. The other set of contacts ties Input 1of the Remote Radio to ground.
- Input 1 of the Remote Radio is now connected to ground through the relay contacts and is activated. This status change is transmitted to the Master.
- Output 1 of the Master is activated, which turns the LED ON.

This setup confirms the Remote Radio received the status change and it indicates the status of the device connected to the Remote Radio.

You do not have to "program" the Inputs in the ControlPAK software. The programming is only on the Outputs of the Remote Radio.

For example, if we are programming the outputs of the Remote COMMPAK I/O8 the programming for the I/O configuration would be shown below:


I/O Mapping Setup
Output 1: Activated By Radio Address: 0 Input Number: 1 Advanced
Output 2: Activated By Radio Address: OFF Input Number: 2 Advanced
Output 3: Activated By Radio Address: OFF Input Number: 3 Advanced
Output 4: Activated By Radio Address: OFF Input Number: 4 Advanced
Output 5: Activated By Radio Address: OFF Input Number: 5 Advanced
Output 6: Activated By Radio Address: OFF Input Number: 6 Advanced
Output 7: Activated By Radio Address: OFF Input Number: 7 Advanced
Output 8: Activated By Radio Address: OFF Input Number: 8 Advanced

Any Output can activate any Input.

For more information on configuring refer to the section on *Configuring Your I/O8 Radio*.

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Testing

Testing a Wireless Link

Use the following procedure to test a wireless link:

NOTE: Always perform these test on a bench or in a lab setting before field deploying your system.

1. Program one radio as a **Master** and one as a **Remote**.
   Working with two radios helps you understand their basics features and functionality.
2. Setup up the radios with the most basic application of a switch on the master activating an output on the Remote.
   If the radios can "see" each other, not only will the link light be active on the Remote Radio but the correct LED confirmation will occur on the Output.

Once you understand how the two radios should work, repeat this test process with each additional radio you plan to add to the system.

Refer to the following section on *Configuring Your I/O8 Radio*.

Optimizing a Wireless Link

After testing your Wireless Link to determine it is working, use the following procedure to optimize your Wireless Link among the radios in your system.

NOTE	Perform this procedure in the field; in a lab setting you should always have near-perfect results.

When mounting the remote radio antennas:

- Mount the antennas on the highest possible point; for example, the luminaire of a traffic light.
- Mount the antennas with a clear line of site to one another.
- Make sure the polarization of each antenna matches for the entire system; for example vertical or horizontal, no mix.
- Physically tighten the antenna connections and move on to the next remote location. Repeat this procedure at each Remote radio site.

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Optimizing to Minimize Noise Interferences

To minimize Noise Interferences on your system:

1. Change the polarization of the antennas to horizontal.
2. Run the Spectrum Scan to determine where most of the noise occurs. Change the Hop Pattern of the system to ensure that the pattern is overlapping the noise the least.

For Non-Integrated Antenna Systems

Non-integrated units do not have polarization stickers, but can be properly oriented by changing the direction the antenna elements are facing.

If a non-integrated antenna's elements are pointing up and down (the elements are running parallel to the pole), it is in the vertical position and has vertical polarization.

To change the polarization to horizontal, rotate the antenna 90 degrees, so the antenna's elements are parallel to the ground.

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Appendix A: Acceptable Antennas for I/O8 Use

Antenna Overview

There are 2 types of antennas typically used for COMMPAK I/O 8 Systems: the Yagi and the Omni antenna. Other types of antennas can be used if your system has special requirements.

Yagi antennas are directional antennas that transmit and receive signals primarily from the front of the antenna. They also transmit and receive signals from the sides and back but at reduced levels. The Yagi antenna can be installed Vertically or Horizontally polarized.

Yagi antennas are used for Remote COMMPAK I/O8 sites, as these sites only communicate with the Master site or a Repeater site. Yagi antennas can be used at the Master and Repeater sites if the System layout will allow acceptable signal levels between Sites. A Repeater Site, for example, with a Yagi Antenna may have some Remote sites communicating via the back of the Yagi, which is acceptable if the Received Signal strength is high enough and stable.

Omni directional antennas transmit and receive signals in all directions around the 'sides' of the antenna. The Omni antenna is only available as Vertically polarized. Omni antennas are typically used at the Master and Repeater sites.

Antenna Polarization and Clearance

Antenna polarization is an important factor in the installation of your System. A Vertically Polarized antenna transmits the radio signal waves perpendicular to the earth's surface. A Horizontally Polarized antenna transmits the radio signal waves parallel to the earth's surface. ALL of the antennas in a System must have the same polarization.

Antenna clearance is another factor that must be considered. Yagi antennas should be installed with no obstructions in front of or close to the sides. Omni antennas ideally should be mounted with no obstructions close to them but they can be mounted to the side of a pole, etc. with the required offset.

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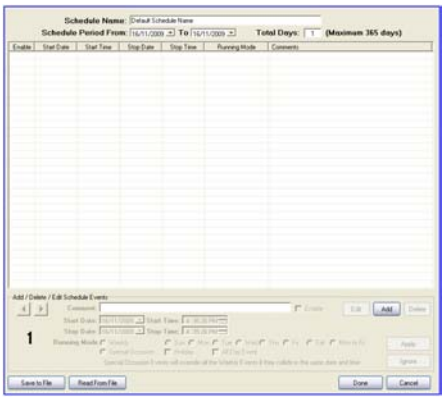
Appendix B: Using the Schedule Input Wizard

Create a New Schedule with the Schedule Wizard

1. Enable the schedule option by placing a check mark in the Enable Scheduler box.

2. From the ***IO Setup Tab***, select the *Schedule Input Wizard* to Create a New Schedule. You will be taken to the *Schedule Input Wizard* screen.



3. Select the **ADD** Button to highlight the Add/Delete/Edit Schedule Events field. Complete the following fields on the *Add/Delete/Edit Schedule Events* field (refer to the table on the following page):

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Section	Field Name	Description
Schedule Information	Comment	Enter a radio description (up to a maximum of 50 characters). Place a check mark in the Enable box beside the Comment field.
Schedule Date & Time	Start Date	Select the starting date for your scheduled events from the drop down calendar menu. The format will be represented as day/month/year.
	Stop Date	Select the ending date for your scheduled events from the drop down calendar menu. The format will be represented as day/month/year.
	Start & Stop Time	The Start Time is in a 12-hour format and is user defined by highlighting the selected entry and scrolling to the time to be applied on the Start Date. The Stop Time is in a 12-hour format and is user defined by highlighting the selected entry and scrolling to the time to be applied on the Stop Date.
Daily Event	Running Mode	**The Running Mode allows the user to choose what days during the Start and Stop Dates the event is to occur**. The events can occur on a Weekly or Special Occasion basis. **Weekly Running Mode:** Select the day option that the event is to occur on. **Special Occasion:** Select this option if you would like to add a Holiday or an All Day Event to the schedule. An All Day Event for example could be Parent/Teacher Interviews.

4. After you finish adding in the Date and Time of your Scheduled Events, you have a few options:

   - **Add in more Scheduled Events to this schedule**. If you would like to add in more events to this schedule click the ADD button to enter in additional events.
   - **Save the Current Schedule**. **<u>It is highly recommended to save your Schedule at all times.</u>** This should be stored in a directory on your computer for later access if needed. Use the **Save to File** button to save your schedule.

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Create a New Schedule by Manual Entry

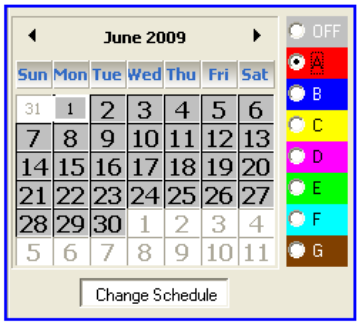
An alternate method allows for a schedule to be manually entered in the WEB I/O. A manual entry is useful if you need to add an extra time slot to a particular schedule but still would like to maintain the original schedule.

A time group is denoted by the letters A to G and each group can have up to eight events. Only one time group can be used on a particular day.

To set a manual entry:

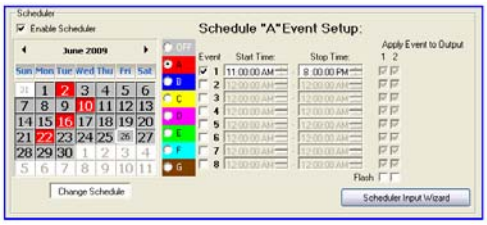
1. Select the *Change Schedule* button and this will activate the time group letters.

2. Select a time group, i.e. “A”. This will highlight the Event option:



3. Place a check mark in the event number that is to be used. This will enable the start/stop time to be added for the event. Select the desired start/stop time for the event.

4. Add the new event to the calendar by clicking on the days that the event is to occur on.



When the event has been added to the days on the calendar, de-select the *Change Schedule* button.

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Appendix C: Advanced I/O Mapping Configuration

Advanced I/O Input Configurations

The advanced I/O Input Configurations are for advanced users in setup of their inputs.

The fields are described on the next page:

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Section	Field Name	Description
I/O Advanced Setup	Enable	**Default is enabled**. To disable a particular input uncheck the Enable box.
	Invert	**Default is disabled**. To enable the invert for the input place a check mark in the Invert box.
	Input De-bounce Time	**Default is 0ms**. Select from the drop down menu the time needed for the system to recognize that a particular input is correctly applied and it is not a miscellaneous error in the input being applied.
	Input Response Delay Time	**Default is 0ms**. Select from the drop down menu the time needed for the system to recognize a particular input after it is being delayed for X amount of time.
	Input Filter Time	**Default is 0ms.**
	Input Map to Address #	This field is greyed out and for Encom internal use only.
	Push Button Configuration	The Push Button applied as an input can either be Latched (remain active when pushed) or Momentary (pushed and input is no longer applied once the push button is released). If a Push Button is to be Latched, the time needed to remain latched active can be user inputted or unlimited time selected.

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Advanced I/O Output Configurations

The Advanced I/O Output Configurations are for advanced users only. The advanced fields are described below:

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Section	Field Name	Description
I/O Advanced Setup	Failsafe Time	**Default is 10s**. This entry configures the amount of time the radio will wait for data for an Output before reverting that Output to its Failsafe condition.
	Failsafe Mode	**Default is OFF**. OFF – The Output will turn OFF until the radio receives data. ON – The Output will turn ON until the radio receives data. LAST – The Output will maintain its last state until the radio receives data. FLASH – The Output will turn ON and OFF until the radio receives data.

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Appendix D: RF Exposure

FCC

FCC Regulations allow up to 36 dBm effective radiated power (ERP). Therefore, the sum of the transmitted power (in dBm), the cabling loss and the antenna gain cannot exceed 36 dBm.

- 1 mW = 0 dBm
- 10 mW = 10 dBm
- 100 mW = 20 dBm
- 1000 mW = 30 dBm

When transmitting 1 Watt (30 dBm) and the cable and connector losses are 2 dB, the antenna gain cannot exceed 36 – (-2) – 30 = 8 dBi.

If an antenna with a gain higher than 8 dBi were to be used, the power setting must be adjusted appropriately.

Health Canada

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website www.hc-sc.gc.ca/rpb.

Appendix D: Declaration of Conformity

FCC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference
(2) This device must accept any interference received including interference that may cause undesired operation.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada

This device complies with Industry Canada RSS-210 specifications

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